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[54] **GPS VEHICLE COLLISION AVOIDANCE WARNING AND CONTROL SYSTEM AND METHOD**

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Related U.S. Application Data

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[52] **U.S. Cl.** **701/301;** 701/27; 701/98; 701/214; 340/903; 340/436; 342/455

[58] **Field of Search** 701/23, 24, 27, 701/200, 213, 214, 93, 98, 300, 301; 340/903, 905, 435, 436; 342/29, 41, 454, 455; 180/167–170

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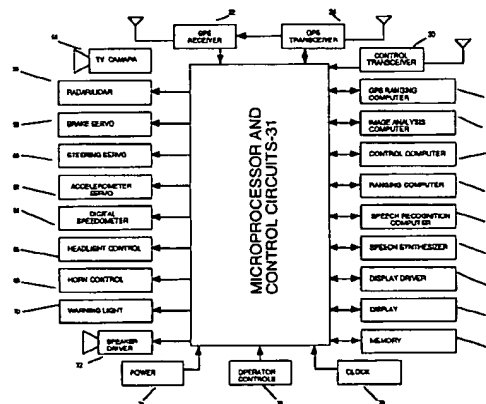
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[57] **ABSTRACT**

GPS satellite (4) ranging signals (6) received (32) on comm1, and DGPS auxiliary range correction signals and pseudolite carrier phase ambiguity resolution signals (8) from a fixed known earth base station (10) received (34) on comm2, at one of a plurality of vehicles/aircraft/automobiles (2) are computer processed (36) to continuously determine the one's kinematic tracking position on a pathway (14) with centimeter accuracy. That GPS-based position is communicated with selected other status information to each other one of the plurality of vehicles (2), to the one station (10), and/or to one of a plurality of control centers (16), and the one vehicle receives therefrom each of the others' status information and kinematic tracking position. Objects (22) are detected from all directions (300) by multiple supplemental mechanisms, e.g., video (54), radar/lidar (56), laser and optical scanners. Data and information are computer processed and analyzed (50,52,200,452) in neural networks (132, FIGS. 6–8) in the one vehicle to identify, rank, and evaluate collision hazards/objects, an expert operating response to which is determined in a fuzzy logic associative memory (484) which generates control signals which actuate a plurality of control systems of the one vehicle in a coordinated manner to maneuver it laterally and longitudinally to avoid each collision hazard, or, for motor vehicles, when a collision is unavoidable, to minimize injury or damage therefrom. The operator is warned by a heads up display and other modes and may override. An automotive auto-pilot mode is provided.

44 Claims, 17 Drawing Sheets

VEHICLE SYSTEM BLOCK DIAGRAM